Application Note

Metaswitch VP2510 Integrated Softswitch: Connecting Cisco Unified Communications Manager 8.6 via the Cisco Unified Border Element 8.7 using SIP

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EDCS# 1176211 Rev # Initial version

Note: Testing was conducted at TekVizion labs.

7/12/2012

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Introduction

Service Providers today, such as Metaswitch, are offering alternative methods to connect to the PSTN via their IP network. Most of these services utilize SIP as the primary signaling method and a centralized IP to TDM gateway to provide on-net and off-net services. Metaswitch is a service provider offering that allows connection to the PSTN and may offer the end customer a viable alternative to traditional PSTN connectivity via either Analog or T1 lines. A demarcation device between these services and customer owned services is recommended. The Cisco Unified Border Element provides demarcation, security, interworking and session management services.

- This application note describes how to configure a Cisco Unified Communications Manager (Cisco UCM) 8.6 with a Cisco Unified Border Element (Cisco UBE) 8.7 for connectivity to Metaswitch VP2510 Integrated Softswitch. The deployment model covered in this application note is CPE to PSTN.This document does not address 911 emergency outbound calls. For 911 feature service details contact Metaswitch, directly.
- Testing was performed in accordance to Cisco's SIP Trunk Test Plan and all features were verified. Key features verified are:
    - CPE outbound to SP Offnet gateway(PSTN) (G.729 is offered first)
    - SP offnet gateway(PSTN) inbound to CPE (G.729 offered first)
    - CPE to CPE (place call out to the SP network and back) (G.729 is offered first)
    - CPE Calling number privacy
    - CPE Telephone Number Support – digit translations
    - CPE Calling Name Delivery
    - CPE offnet Call Conference
    - CPE Intra-Site Call Conference
    - CPE Intra-Site Attended Call Transfer
    - CPE Intra-Site Unattended Call Transfer
    - CPE Intra-Site Blind Call Transfer
    - CPE Call Hold and Resume (call hold is always done on the IP PBX side)
    - CPE Voice Mail
    - SP Voice Mail
    - CPE Find Me (CFU)
    - CPE T.38 FAX SG3 (G.729 is offered first)
    - Simultaneous Calls
    - CPE Auto Attendant
    - CPE to PSTN Offnet gateway international call
    - CPE G.711 FAX SG3
    - CPE Find Me (Call Forward On Busy)
    - CPE Find Me (Call Forward Don't Answer)
    - Codec mid-call re-negotiation (to be tested without transcoder)

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- PRACK with SDP (early-media cut-through with DTMF (RFC2833) navigation before 200OK)) - call 800-864-8331 - United Airlines

- The Cisco Unified Border Element configuration detailed in this document is based on a lab environment with a simple dial-plan used to ensure proper interoperability between Metaswitch SIP network and Cisco Unified Communications. The configuration described in this document details the important commands to have enabled for interoperability to be successful and care must be taken, by the network administrator deploying Cisco UBE, to ensure these commands are set per each dial-peer requiring to interoperate to Metaswitch SIP network.
- This application note does not cover the use of calling search spaces (CSS) or partitions on Cisco Unified Communications Manager. To understand and learn how to apply CSS and partitions refer to the cisco.com link below:

  http://www.cisco.com/en/US/partner/docs/voice_ip_comm/cucm/admin/8_0_2/ccmsys/a03ptcss.html

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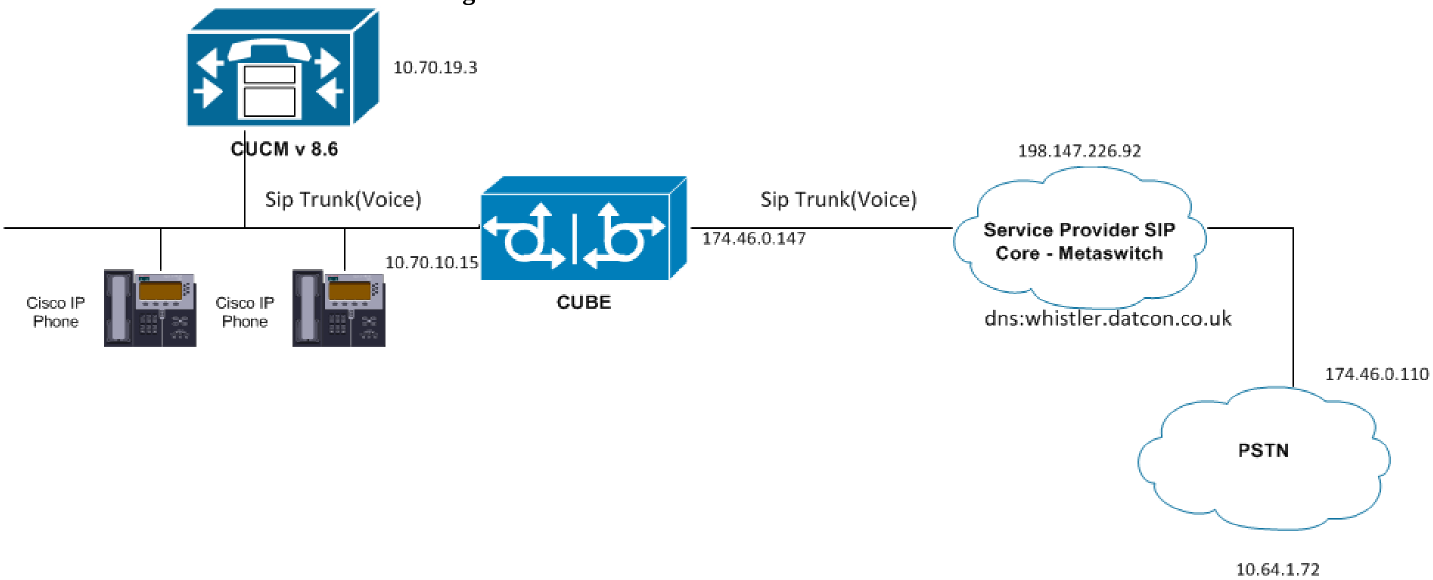
Network Topology

Figure 1 Basic Test Environment



System Components

Hardware Components

Component	Qty	Hardware	Notes
Call Manager	1	MCS7835	
CUBE	1	CISCO3945	
PSTN GW	1	C3845	To handle PSTN calls
Switch	1	C6509	Lab Switch
Cisco Phones	4	7962,9971,	Cisco Phones used as CPE.
Metaswitch VP2510 Integrated Softswitch	1	-	Third Party SIP Trunk Provider

Software Requirements

Component	Qty	Software Version	Firmware Version
Metaswitch VP2510 Integrated Softswitch	1	V7.3.00 SU56	
CUBE (10.70.10.15)	1	c3900e-universalk9-mz.SPA.151-4.M4.bin	
Communications Manager	1	8.6.1.20000-1	
Local PSTN GW	1	C3845-advipservicesk9-mz, Version 12.4(24)T	
Main Switch	1	Cisco WS-C6509 s3223-adventerprisek9_wan-mz, Version 12.2(33	
Cisco Phone 7960 (x2644)	1	P0S3-8-12-00	
Cisco Phone 9971 (x2700)	1	sip9971.9-1-1SR1	
Cisco Phone7962(x2604)	1	SCCP42.9-2-1S	

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Features

Features Supported

- Call from/to PSTN to/from CPE – Basic and International calls , digit translations
- Hold/Resume
- DTMF
- Call transfers – attended, blind, unattended
- Call Forwarding (CFU,CFB,CFNA)
- FAX : T.38 and G711ulaw
- Support for early media

Features Not Supported

- Connected party update

Caveats

- As connected party update is currently not supported by Metaswitch, CLID updates are not observed on call transfer scenarios.
- Metaswitch doesn't allow T.38 to T.38 or T.38 to G711 calls to traverse their UMG.Therefore the FAX calls were tested with media flowing directly from the CUBE to the PSTN gateway.
- During the call transfer scenarios, no ring back is heard on the transfering party when a transfer is initiated i.e : When A and B are in call and B initiates a transfer to C, B does not hear a ring abck when C is ringing. Even afetr B transfers the call in te case of an unattended transfer, A doesn't hear the ring back.

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Configuration

Configuring Cisco Unified Border Element

Show version:

```
CUBE#       sho ver
Cisco IOS Software, C3900e Software (C3900e-UNIVERSALK9-M), Version 15.1(4)M4,
RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Tue 20-Mar-12 22:07 by prod_rel_team

ROM: System Bootstrap, Version 15.1(1r)T4, RELEASE SOFTWARE (fc1)

CUBE uptime is 19 hours, 16 minutes
System returned to ROM by reload at 18:52:52 UTC Mon Jun 25 2012
System restarted at 18:56:47 UTC Mon Jun 25 2012
System image file is "flash:c3900e-universalk9-mz.SPA.151-4.M4.bin"
Last reload type: Normal Reload
Last reload reason: Reload Command

This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco CISCO3945-CHASSIS (revision 1.0) with C3900-SPE250/K9 with 2064384K bytes of
memory.
Processor board ID FTX1541A032
4 Gigabit Ethernet interfaces
2 Voice FXS interfaces
DRAM configuration is 72 bits wide with parity enabled.
256K bytes of non-volatile configuration memory.
500472K bytes of ATA System CompactFlash 0 (Read/Write)


License Info:

License UDI:

-------------------------------------------------
Device#   PID                   SN
-------------------------------------------------
*0        C3900-SPE250/K9       FOC15391VLH
```

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```
Technology Package License Information for Module:'c3900e'

------------------------------------------------------------------
Technology    Technology-package           Technology-package
              Current       Type           Next reboot
-------------------------------------------------------------------
ipbase        ipbasek9      Permanent      ipbasek9
security      None          None           None
uc            uck9          Permanent      uck9
data          None          None           None

Configuration register is 0x2102
```

Configuration:

```
CUBE#sho run
Building configuration...


Current configuration : 14018 bytes
!
! Last configuration change at 19:28:57 UTC Mon Jun 18 2012 by administrator
! NVRAM config last updated at 19:28:59 UTC Mon Jun 18 2012 by administrator
! NVRAM config last updated at 19:28:59 UTC Mon Jun 18 2012 by administrator
version 15.1
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname CUBE
!
boot-start-marker
boot system flash c3900e-universalk9-mz.SPA.151-4.M4.bin
boot-end-marker
!
!
logging buffered 51200 warnings
enable secret 5 $1$lbTj$25nxZBh5UBjnxOrx9aRvn/
!
no aaa new-model
!
no ipv6 cef
ip source-route
!
!
ip cef
!
!
!
ip domain name yourdomain.com
ip name-server 10.85.0.232
multilink bundle-name authenticated
!
!
!
!
!
crypto pki token default removal timeout 0
```

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```
!
crypto pki trustpoint TP-self-signed-3709846528
 enrollment selfsigned
 subject-name cn=IOS-Self-Signed-Certificate-3709846528
 revocation-check none
 rsakeypair TP-self-signed-3709846528
!
!
crypto pki certificate chain TP-self-signed-3709846528
 certificate self-signed 01
  3082022B 30820194 A0030201 02020101 300D0609 2A864886 F70D0101 05050030
  31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274
  69666963 6174652D 33373039 38343635 3238301E 170D3131 31303039 30303538
  34325A17 0D323030 31303130 30303030 305A3031 312F302D 06035504 03132649
  4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D33 37303938
  34363532 3830819F 300D0609 2A864886 F70D0101 01050003 818D0030 81890281
  8100AF32 1ED94037 AE623623 EA4B82FF 75A7D07B 5DDE35FC E43626A7 42B39B06
  25C99F5B C7B03256 9D971028 F863E825 47C7FF04 9DCD132D B826F0D5 883321F8
  9E1E0D66 69800B78 EE313C88 1B1E2650 0FBE01CA B6B4EF52 0FE02FD0 4D8CEFFA
  AEB71024 4E7B426E E5C5BA8F E0D61A9B 06411555 6BFF0236 A7937023 D54D19A8
  D6CB0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF 301F0603
  551D2304 18301680 143E4473 FBF89536 7F3209E9 929471C9 60D35F0C FF301D06
  03551D0E 04160414 3E4473FB F895367F 3209E992 9471C960 D35F0CFF 300D0609
  2A864886 F70D0101 05050003 818100A6 083C70BD 5A602FFC 7BBE8F60 49621144
  7E0B6CED 59C85C94 03D11568 7BFA9283 F9C7C5AF AE34CA8E 04263221 61D59D86
  C3AB236D C813EA4B A40CC119 4A953EF9 FB99B4B3 1D8C83E0 60A88B90 51DA70E9
  527B3142 438E17FA 3B15D928 04B00A21 C90DCB98 DDD06C8E 989EBD23 313DC9BE
  651B1988 1B980074 0AF355C2 7381E5
        quit
voice-card 0
 dspfarm
 dsp services dspfarm
!
!
!
voice service voip
 ip address trusted list
  ipv4 10.10.0.133
  ipv4 10.64.1.72
  ipv4 10.70.1.2
  ipv4 200.50.67.0 255.255.255.0
  ipv4 0.0.0.0 0.0.0.0
  ipv4 198.147.226.0
  ipv4 198.147.226.0 255.255.255.0
 address-hiding
 mode border-element
```

Enabling CUBE mode

For Fax protocol tests – t38 and g711u protocols were tested. To configure for G711u fax :,use command : *fax protocol pass-through a711ulaw*

```
 allow-connections sip to sip

 fax protocol t38 version 0 ls-redundancy 0 hs-redundancy 0 fallback none
 sip
  rel1xx supported "rel100"
  min-se 180 session-expires 180
  g729 annexb-all
!
voice class codec 1
 codec preference 1
g729br8
```

Codecs used for test: Change order of preference based on codec being tested

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```
 codec preference 2
g711ulaw
 codec preference 3
g729r8
!
!
!
!
voice translation-rule 1
 rule 1 /\+\(1..........\)/ /\1/
!
!
voice translation-rule 4
 rule 1 /412142425996/ /12142425996/
!
!
voice translation-profile addplus
 translate called 2
!
voice translation-profile rmv_one
 translate called 3
!
voice translation-profile strip4
 translate called 4
!
!
license udi pid C3900-SPE250/K9 sn FOC15391VLH
!
!
hw-module pvdm 0/0
!
username administrator password 7 105A0C123346085A5C0A
!
redundancy
!
!
!
!
translation-
rule 2
 Rule 1
6049380601 2629
 Rule 2
6049380602 2700
 Rule 3
6049380603 2644
 Rule 4
6049380604 2604
 Rule 5
6049380605 2302
!
!
translatio
n-rule 3
 Rule 1
0601 2629
 Rule 2
0602 2700
```

Translation rule for 10 digit (from MetaSwitch) to 4 digit private extensions on Cisco.

Translation rule for 4 digit (from MetaSwitch) to 4 digit private extensions on Cisco.

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```
 Rule 3
0603 2644
 Rule 4
0604 2604
!
!
translation-rule
4
 Rule 1 3001
6049380601
 Rule 2 3002
6049380602
 Rule 3 3003
6049380603
 Rule 4 3004
6049380604
```

Translation rule for translating 4 digit to 10 digit numbers.

```
!
!
!
!
!
interface GigabitEthernet0/0
 description $ETH-LAN$$ETH-SW-LAUNCH$$INTF-
INFO-GE 0/0$
 ip address 10.70.10.15 255.255.0.0
 duplex full
 speed 100
```

CUBE LAN side connection to CUCM

```
!
interface GigabitEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface GigabitEthernet0/2
description Connection to
Metaswitch
 ip address 174.46.0.147
255.255.255.128
 duplex full
 speed 100 duplex auto
 speed auto
```

CUBE WAN side connection to MetaSwitch

```
!
interface GigabitEthernet0/3
 no ip address
 shutdown
 duplex auto
 speed auto
!
ip forward-protocol nd
!
ip http server
ip http access-class 23
ip http authentication local
ip http secure-server
ip http timeout-policy idle 60 life 86400 requests 10000
!
```

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```
ip route 0.0.0.0 0.0.0.0 174.46.0.129
ip route 10.10.0.0 255.255.0.0 192.168.100.1
ip route 10.64.0.0 255.255.0.0 10.70.10.1
ip route 10.70.0.0 255.255.0.0 10.70.10.1
!
access-list 23 permit 10.10.10.0 0.0.0.7
!
nls resp-timeout 1
cpd cr-id 1
!
!
control-plane
!
!
voice-port 0/0/0
 station-id name test
 station-id number
16049380602
 caller-id enable
!
voice-port 0/0/1
 station-id name test
 station-id number
16049380604
 caller-id enable
!
!
!
mgcp profile default
!
sccp local GigabitEthernet0/0
sccp ccm 10.70.20.2 identifier 1 priority 1 version 6.0
!
sccp ccm group 23
 description tvg MTP
 bind interface GigabitEthernet0/0
 associate ccm 1 priority 1
 associate profile 23 register tvg1mtp
!
sccp ccm group 111
 description tvg1 transcoding
 bind interface GigabitEthernet0/0
 associate ccm 1 priority 1
 associate profile 111 register tvg1txcode
!

dial-peer voice 5996 voip
 shutdown
 destination-pattern 21424259..
 session protocol sipv2
 session target ipv4:10.64.1.72:5060
 dtmf-relay rtp-nte h245-signal h245-alphanumeric
 codec g711ulaw
!
dial-peer voice 9 pots
 description to fax port
 destination-pattern
6049380602
 no digit-strip
```

Voice Ports configured for FAX tests – CPE-CPE

Dial peers for FAX call routing

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```
 port 0/0/0
!
dial-peer voice 12 pots
 description to fax port
 destination-pattern
6049380604
 no digit-strip
 port 0/0/1
!
dial-peer voice 15 voip
 description Trunk to Metaswitch
 destination-pattern 1..........
 session protocol sipv2
 session target
dns:whistler.datcon.co.uk
 incoming called-number .%
 voice-class codec 1 offer-all
 dtmf-relay rtp-nte
!
dial-peer voice 16 voip
 description To Cluster4
 destination-pattern
60493806O[0-9]
 translate-outgoing called
2
 session protocol sipv2
 session target
ipv4:10.70.19.3
 incoming called-number .%
 voice-class codec 1 offer-
all
 dtmf-relay rtp-nte
!
dial-peer voice 17 voip
 destination-pattern 1866.......
 session protocol sipv2
 session target
dns:whistler.datcon.co.uk
 voice-class codec 1 offer-all
 dtmf-relay rtp-nte
!
dial-peer voice 18 voip
 description to call PBX-PBX
 translation-profile outgoing
addplus
 destination-pattern 604938060[0-
9]
 session protocol sipv2
 session target
dns:whistler.datcon.co.uk
 voice-class codec 1 offer-all
 dtmf-relay rtp-nte
!
dial-peer voice 19 voip
 description Mapping to private extensions
 shutdown
 destination-pattern 060[0-9]
 translate-outgoing called 3
```

Dial peer for routing all incoming calls towards MetaSswitch

Dial peer for routing calls towards CUCM

Dial peer for routing early media number – United Airlines number

Dial peer for routing calls from CPE-CPE – via MetaSwitch

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```
 session protocol sipv2
 session target ipv4:10.70.19.3
 incoming called-number 3...
 voice-class codec 1 offer-all
 dtmf-relay rtp-nte
!
dial-peer voice 20 voip
 description mapping 4 digit to private
 destination-pattern 3...
 translate-outgoing called 4
 session protocol sipv2
 session target dns:whistler.datcon.co.uk
 incoming called-number 3...
 voice-class codec 1 offer-all
 dtmf-relay rtp-nte
!
dial-peer voice 22 voip
 description Intnl calls
 destination-pattern
0119180........
 session protocol sipv2
 session target
dns:whistler.datcon.co.uk
 incoming called-number .%
 voice-class codec 1 offer-all
 dtmf-relay rtp-nte
!
dial-peer voice 602 voip
 description formidcall neg
 huntstop
 shutdown
 destination-pattern 6049380602
 translate-outgoing called 2
 session protocol sipv2
 session target ipv4:10.70.19.3
 incoming called-number .%
 dtmf-relay rtp-nte
 codec g729br8
!
!
sip-ua
!
!
!
gatekeeper
 shutdown
!
!
banner exec ^CC
% Password expiration warning.
-----------------------------------------------------------------------

Cisco Configuration Professional (Cisco CP) is installed on this device
and it provides the default username "cisco" for  one-time use. If you have
already used the username "cisco" to login to the router and your IOS image
supports the "one-time" user option, then this username has already expired.
You will not be able to login to the router with this username after you exit
this session.
```

Dial peer for routing international calls – that are identified by a 011 prefix.

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```
It is strongly suggested that you create a new username with a privilege level
of 15 using the following command.

username <myuser> privilege 15 secret 0 <mypassword>

Replace <myuser> and <mypassword> with the username and password you want to
use.

-------------------------------------
Feb 23 20:43:16.176: rtpspi_process_timers: Timer 0xA93F798 expired.
Feb 23 20:43:16.176: rtpspi_process_timers: timer expired for type(0x6):
RTP_GLOBAL_INACTIVITY_TIMER
Feb 23 20:43:16.176: rtpspi_handle_rtp_global_timer_expiry: Entered
Feb 23 20:43:16.176: rtpspi_handle_rtp_global_timer_expiry:
rtpspi_count_ccb_with_rtptimeout:0 Nothing to do

Feb 23 20:43:16.176: rtpspi_start_rtp_global_timer --------------------------------
--
^C
banner login ^CC
 ---------------------------------------------------------------------
Cisco Configuration Professional (Cisco CP) is installed on this device.
This feature requires the one-time use of the username "cisco" with the
password "cisco". These default credentials have a privilege level of 15.

YOU MUST USE CISCO CP or the CISCO IOS CLI TO CHANGE THESE  PUBLICLY-KNOWN
CREDENTIALS

Here are the Cisco IOS commands.

username <myuser>  privilege 15 secret 0 <mypassword>
no username cisco

Replace <myuser> and <mypassword> with the username and password you want
to use.

IF YOU DO NOT CHANGE THE PUBLICLY-KNOWN CREDENTIALS, YOU WILL NOT BE ABLE
TO LOG INTO THE DEVICE AGAIN AFTER YOU HAVE LOGGED OFF.

For more information about Cisco CP please follow the instructions in the
QUICK START GUIDE for your router or go to http://www.cisco.com/go/ciscocp
---------------------------------------------------------------------
^C
!
line con 0
 login local
line aux 0
line vty 0 4
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 login local
 transport input telnet ssh
line vty 5 15
 exec-timeout 0 0
 privilege level 15
 logging synchronous
 login local
 transport input telnet ssh
```

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```
!
scheduler allocate 20000 1000
end
```

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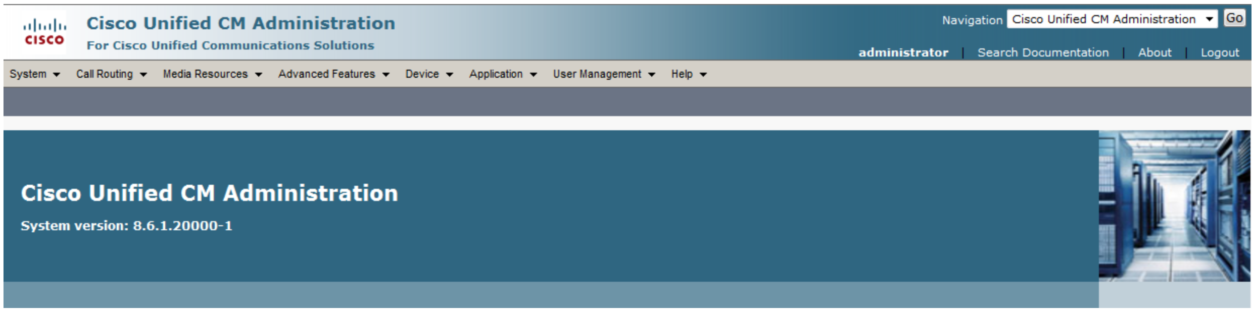
Configuring the Cisco Unified Communications Manager

CUCM Version



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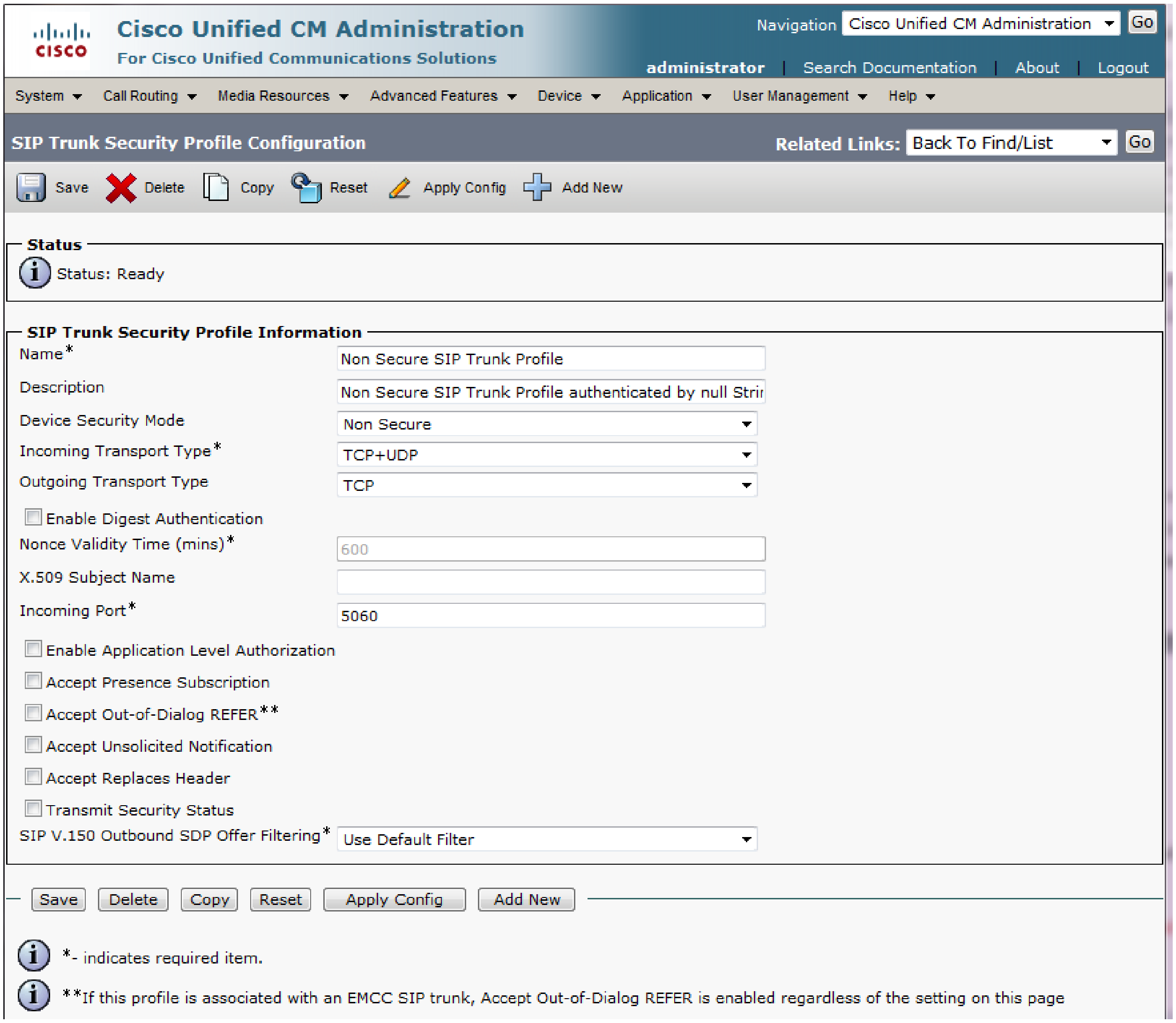
SIP Trunk Profile:

Figure 2 Non-Secure SIP Trunk Profile



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SIP Profile:

Figure 3 SIP profile: Standard SIP Profile- Early Offer (1/2)

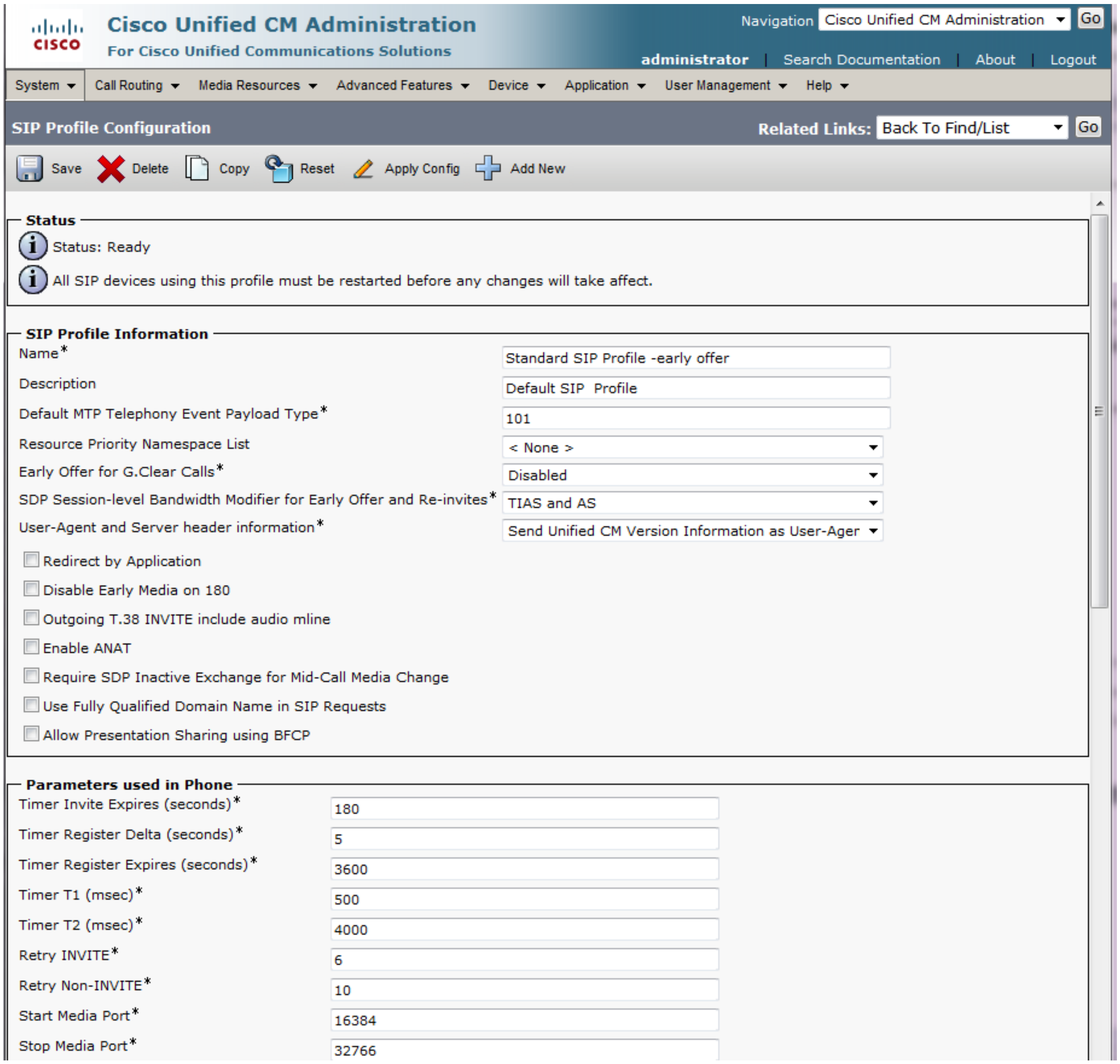

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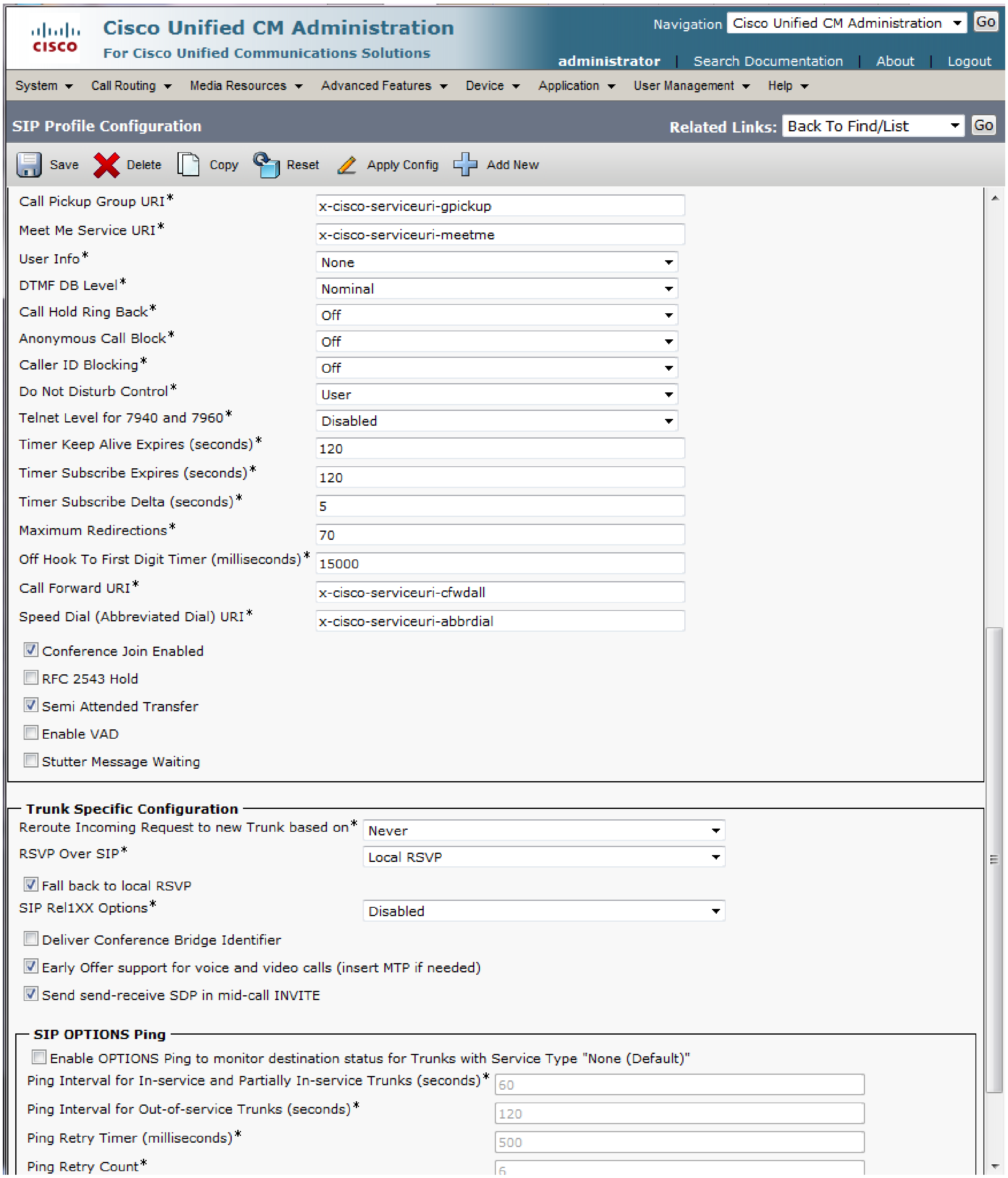
Figure 4 Non-Secure SIP Trunk Profile (2/2)



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Trunk to CUBE:

Figure 5 Trunk to CUBE (1/3)

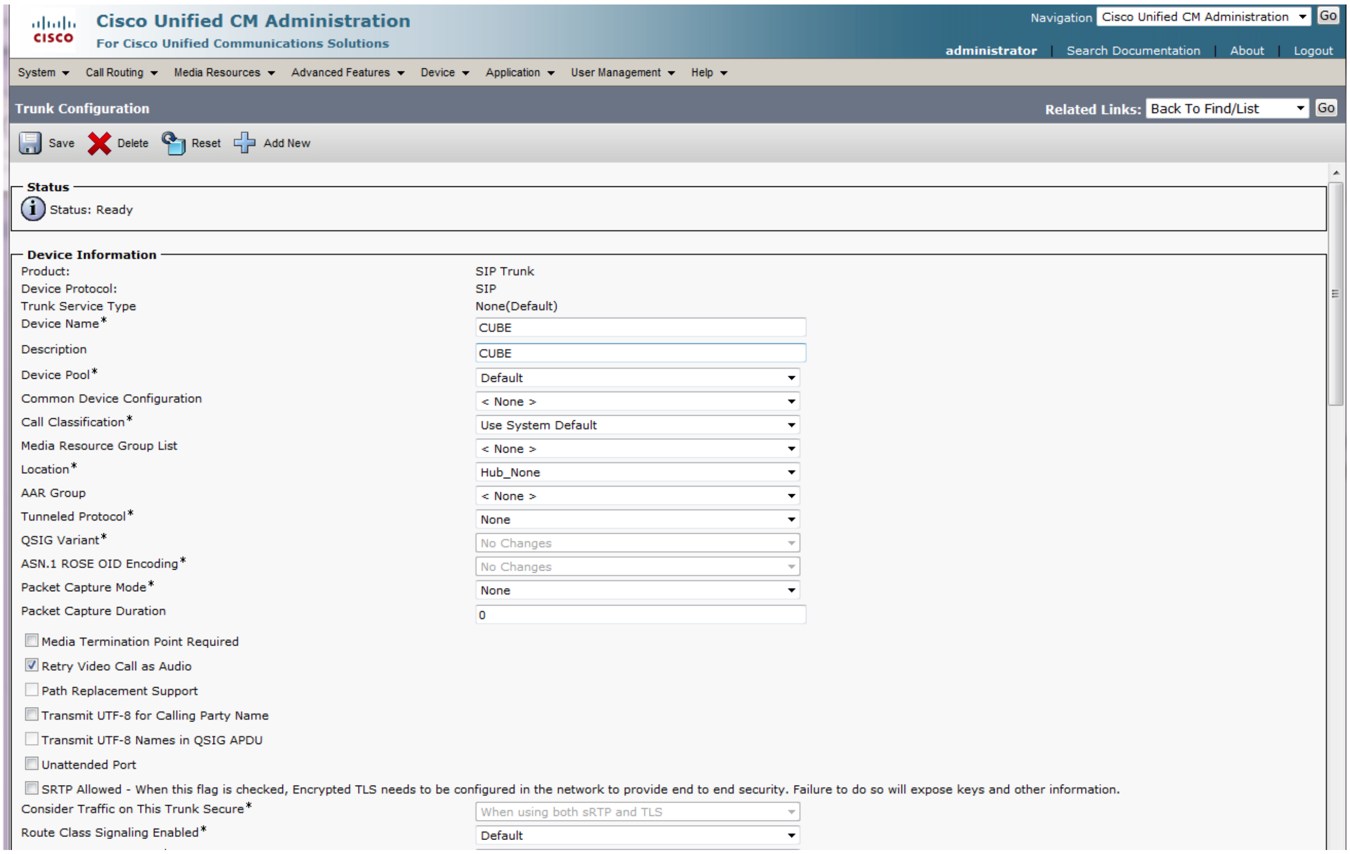

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Figure 6 Trunk to CUBE (2/3)

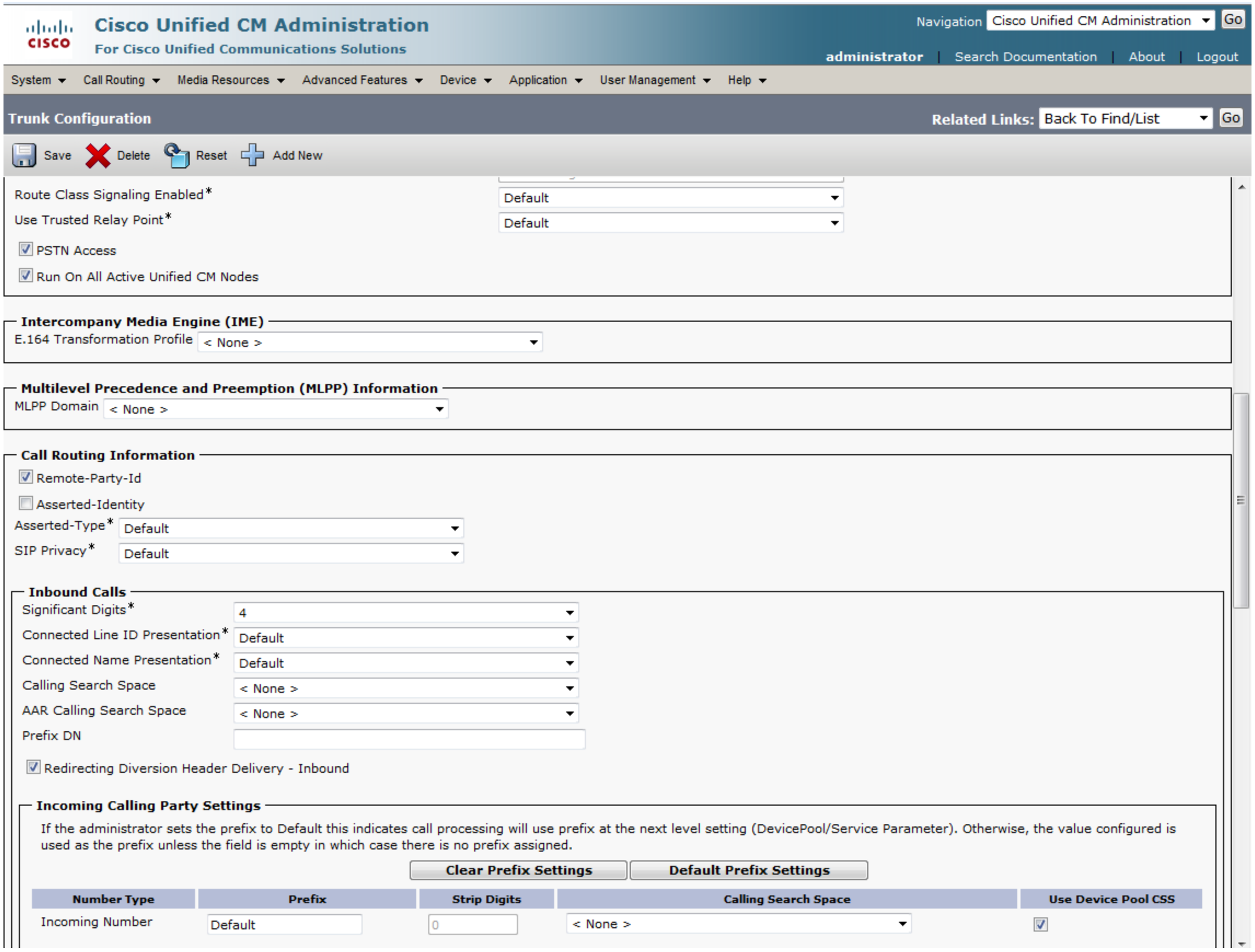
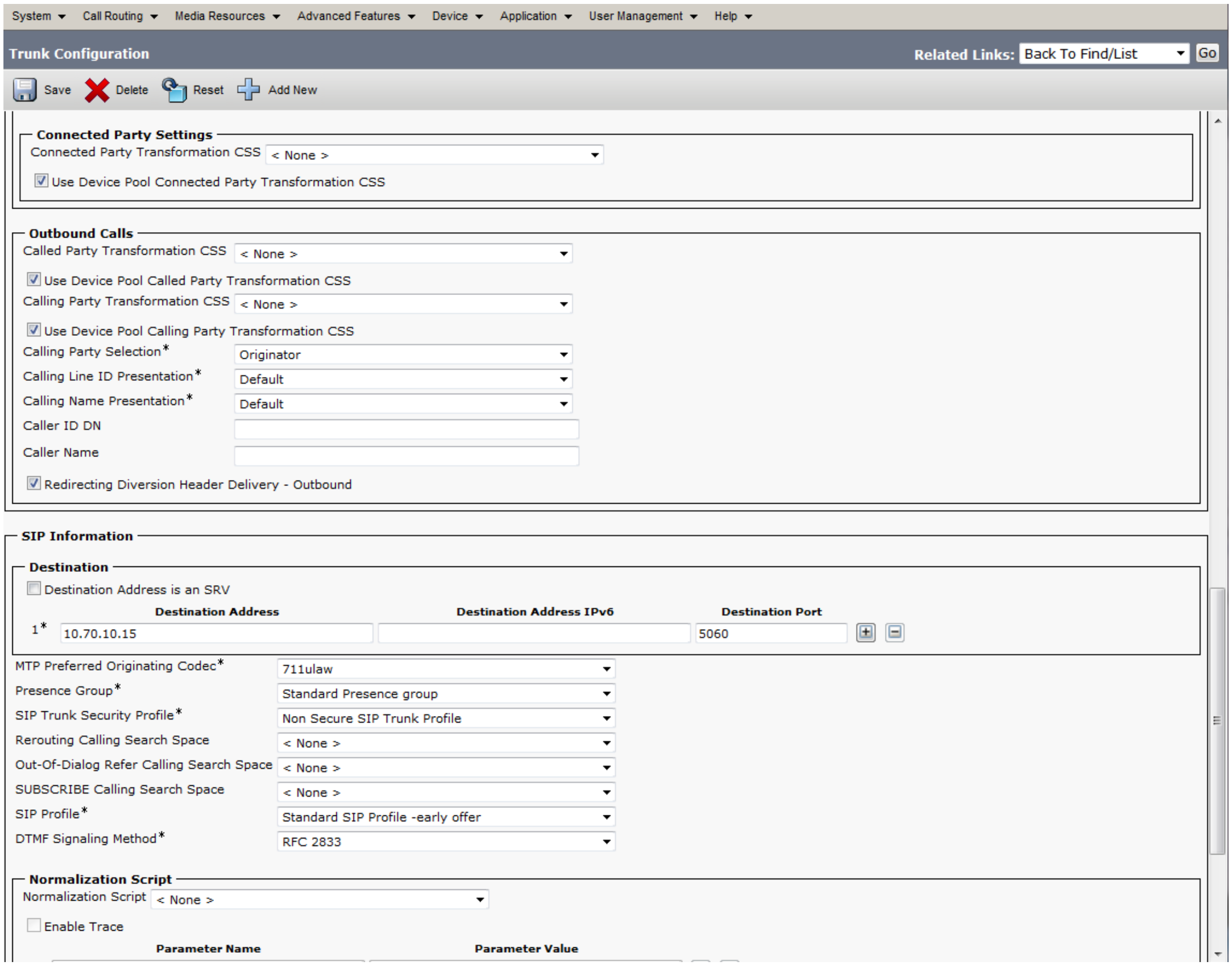


Figure 7 Trunk to CUBE (3/3)



Configuring Route Patterns

Route patterns are configured as below, prefixed by a 4 to identify that a call has to be routed via the CUBE.

4.0119180XXXXXXXX	For International Calls via MetaSwitch	CUBE	
4.1XXXXXXXXXX	TO CUBE for MetaSwitch for PSTN calls	CUBE	
4.300X	TO CUBE for MetaSwitch	CUBE	
4.604938060X	TO CUBE for MetaSwitch	CUBE	

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Acronyms

Acronym	Definitions
SIP	Session Initiation Protocol
SCCP	Skinny Client Control Protocol
Cisco UCM	Cisco Unified Communications Manager
Cisco UBE	Cisco Unified Border Element
PSTN	Public Switched Telephone Network

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